WORKING PAPER SERIES
WORKING PAPER NO 11, 2007

ESI

Sickness Absence and Peer Effects - Evidence from a Swedish Municipality

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ISSN 1403-0586

Sickness Absence and Peer Effects
- Evidence from a Swedish Municipality

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Version September 2010

Abstract

In this paper we use detailed employment records to study to what extent sickness absence among work group colleagues influences individual sickness absence. Our results indicate an overall positive peer effect. However, further analysis show peer behavior to be important for women's sickness absence, but not for men's, and that woman are only affected by their female co-workers. Our findings also suggest that it, on average, takes two to three years for a new employee to become influenced by the absence pattern of the work group. In light of our results, we cannot rule out the possibility of social norms being important to the individual sick leave decision.

Keywords: Peer effects, sickness absence, social norms

JEL classification: J22, Z13

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We are grateful for comments from seminar participants at the EEA and the EALE conferences. In addition, special thanks to Assar Lindbeck and Mats Persson for insightful comments and suggestions. Financial support from the Swedish Social Insurance Agency is acknowledged.

1 Introduction

In spite of good health status and long life expectancy, the Swedish costs for sickness absence are among the highest in Western Europe (Alexanderson and Norlund, 2004). The level of these costs increased dramatically during the second half of the 1990s and despite a decrease in recent years, the level is still very high. In 2006, the expenses for the Swedish sickness insurance system, regarding absence due to illness, amounted to 34 billion SEK (1.2 % of GDP).[1,2]

Many attempts have been made to identify the determinants of sickness absence. Most economic studies dealing with this issue have focused on economic incentives (Henreksson and Persson, 2004; Johansson and Palme, 1996, 2002, 2005; Brown et al., 1999; Barmby et al., 1995), work place characteristics (Drago and Wooden, 1992; Arai and Skogman Thoursie, 2004; Ose, 2005) and macro economic fluctuations (Arai and Skogman Thoursie, 2005). Even though these determinants have been found important to the fluctuations in sickness absence, a remaining concern that cannot fully be explained by traditional models is the differences in patterns of sickness absence observed across and within regions and organizational units. One explanation, proposed in the literature, is that people in different regions, residential areas and work places tend to develop different work norms which are reflected in the levels of sickness absence (Johns, 1994; Lindbeck et al., 2004; Larsson et al., 2005).

The importance of social norms in economic decision making has attained increased attention in recent years and is of particular importance to policy makers. The existence of social interactions implies that interventions, in addition to the direct effect, give rise to indirect effects that are mediated via the interplay of the individuals in society. Estimation of social interactions often amounts to estimating how the behavior of the individual is affected by the average behavior of the individual's reference group (Manski, 1993). The results from these so called "peer effect studies" indicate that the

1 A brief presentation of the Swedish sickness insurance system can be found in the Appendix.

2 The Swedish Social Insurance Agency.

behavior of the group is important in individual decision making.

The purpose of this paper is to investigate if the behavior of the peers is important to the individual sick leave decision. We pursue this aim by estimating to what extent an individual's share of sickness absence is influenced by the share of sickness absence of his/her colleagues. We also test if the peer effect is gender dependent and if it is affected by the length of employment. We adopt a methodology that is common practice in the peer effect literature.

The data used in this study is based on the employment records obtained from the municipality of Örebro and contains yearly data for the period 2003 to 2006. In addition to the statistics on sickness absence exceeding fourteen days that is available in Swedish register data; our data also contains information about shorter spells of sickness absence.[3] Furthermore, due to the highly informative data structure, each individual's reference group can be identified on a very narrow level (work group). Thus, our data enables us to address the problem of confounding effects, often referred to as "the reflection problem" (Manski, 1993, 2000), and the problem of miss-specified peer groups.

Our results show a positive peer effect on the individual's share of sickness absence. However, when separating the measure of peer behavior across gender our results indicate that peer behavior is only important to women. Regarding the dynamics of the peer effect, we find that individuals tend to gradually adapt to the sickness absence of the others in the group, a process which, as indicated by our results, takes two to three years. Based on our results, we interpret the peer effect as measuring some form of social interaction that is important to the individual sick leave decision. Hence, the direct effect of policy interventions reducing sickness absence could be amplified due to the interaction among co-workers.

The rest of our paper is organized as follows: in Section 2 past research related to our study is reviewed. Section 3 outlines the methodology and the data is presented in

[3] Prior to 1992 Swedish register data also contained information on spells shorter than fourteen days.

Section 4. The results are reported in Section 5. Section 6 concludes the paper.

2 Past Research

In the economic literature, incorporation of the social interplay in models for economic decision making is still a relatively new phenomenon. In recent years, however, the strand of literature combining economic decisions and social interactions has increased substantially (see Manski, 2000; Dietz, 2002; Soetevent, 2006, for reviews). One common way to implement the concept of social interactions in economic models is to let the individual's utility from taking an action depend on the actions taken by the reference group. Even though it is theoretically appealing to implement the notion of social interactions in economic models, it is a rather challenging task to estimate the effect empirically (Manski, 2000). Lindbeck and Persson (2008) incorporate social norms in their theoretical model regarding individual absence behavior. In their theoretical framework the social norm, working instead of living off benefits, is taken as given. Individuals acting in a way that does not conform to the norm, i.e. living off benefits, are being stigmatized. The strength of the norm, and hence the magnitude of the social cost inflicted on absent individuals, is allowed to be either exogenous or endogenous in the model. In the case of endogenous norms the strength of the norm depends on the number of people being absent. The discomfort felt by the individual living off benefits is higher (lower) when the proportion of people upholding the norm is high (low). The individuals make their decision about working or not, taking the behavior of all other individuals into consideration. Individual behavior is thus amplified by group influence.

Despite empirical difficulties, a growing number of studies estimating the existence of peer effects are emerging in economic literature. So far, most studies measuring peer effects concern either educational achievements (e.g., Aaronson, 1998; Hoxby, 2000; Sacerdote, 2001; Hanushek et al., 2003) or adolescent substance use (e.g., Norton et al., 1998; Gaviria and Raphael, 2001; Powell et al., 2005; Lundborg, 2006; Clark and Lohéac, 2007). In addition there also some studies regarding peer effects and labor

productivity (e.g., Ichino and Falk, 2006); Mas and Moretti, 2009). The importance of social interactions regarding sickness absence, on the other hand, has received limited attention. Lindbeck et al. (2008) present a theoretical model that combines the impact of economic incentives and social norms. The basic assumption in the model establishes that the social norm is to live off one's own work. Individuals who instead live off welfare are experiencing disutility from breaking the norm. This expected disutility is assumed to vary negatively with the population share living off welfare. Lindbeck et al. (2004) use variance analysis to investigate differences in sick leave patterns across residential areas, as well as across work places. They conclude that the existence of social norms affecting the individual sick leave decision cannot be ruled out. Moreover, their results indicate that social interactions in the work place are particularly important. Using a data set on individuals working for an Italian bank, Ichino and Maggi (2000) investigate work absence differentials between workers in southern and northern Italy. They find that there are different cultures emerging in the north and in the south, causing the probability of an individual being absent to vary between the two regions. Furthermore, they find that individuals that move from one branch to another change their absence behavior in accordance with the absence culture in the new branch. Recent work by Lindbeck et al. (2007) proposes several identification strategies to establish the existence of social interactions on the neighborhood level. Irrespective of identifying assumption, their results indicate the importance of social interactions in the individual sick leave decision. Hesselius et al. (2008, 2009) utilize a randomized social experiment, that reduces the monitoring of sickness absence, in order to identify how individuals influence each others sick leave decision. Their results show a strong interaction effect within ethnical groups as well as within work places.

In sociology, social psychology and in organizational theory the importance of social norms in individual decision making has long been emphasized. Individuals are acknowledged to be directly and indirectly influenced by the thoughts, values and behavior of their co-workers (Kelley, 1952). In particular, perceived norms are found to correlate positively with actual behavior. In this strand of literature two concepts have come to play a central role: cohesion and demographic conformity. The cooperative

behavior in a group is found to be positively correlated to the cohesion of the group (Kidwell et al., 1997; Sanders and Nauta, 2004). In turn, cohesion depends on demographic conformity. Groups with similar demographic characteristics are plausible to have stronger cohesion than groups with relatively more diverse demographic characteristics. It has been shown that demographic diversity decreases communication and social contact within a group (Blau, 1977; O'Reilly et al., 1988). It may, in fact, cause subgroups to emerge (Lau and Murnigham, 1998) where the cohesion within the subgroup is expected to be strong but the cohesion in the group as a whole is expected to be weak. The subgroups are usually formed on the basis of demographic attributes (age, gender, race etc.) reflecting the fact that individuals have a propensity to interact and bond with peers that are similar to themselves (Louch, 2000; Sanders and Nauta, 2004). Regarding dynamics of group behavior, research has shown that the process of group socialization consists of several steps and that new workers need time to adjust to the norms and the behavior of the new group. This implies that the time it takes for an individual to adapt to the group behavior can vary from one individual and group to the next and from one situation to another (see Saks and Ashforth, 1997, for a review).

3 Methodology

3.1 The Models

The empirical model (*Model 1*) is given by

$$(1)\quad s_{iga} = \beta \bar{S}_{-i,ga} + \mathbf{X_{iga}}\phi + \mathbf{Y_a}\gamma + \mathbf{D_a}\varphi + \varepsilon_{iga},$$

where s_{iga} is the sickness absence for individual i in work group g at work place a. $\bar{S}_{-i,ga}$ is the average sickness absence, in work group g at workplace a, excluding individual i. $\mathbf{X_{iga}}$ denotes a vector of personal characteristics, $\mathbf{Y_a}$ represents a vector of work place characteristics and $\mathbf{D_a}$ denotes a vector of work place dummies. Finally, ε_{iga} is the error term.

In order to incorporate the insights from research in sociology and social psychology regarding group behavior, *Model 1* is rewritten to allow peer behavior to vary with gender. The corresponding empirical model (*Model 2*) is given by:

$$(2)\quad s_{iga} = \beta_f \bar{S}_{fga} + \beta_m \bar{S}_{mga} + \delta_f d_f \bar{S}_{fga} + \delta_m d_f \bar{S}_{mga} + \mathbf{X_{iga}}\phi + \mathbf{Y_a}\gamma + \mathbf{D_a}\varphi + \varepsilon_{iga}$$

In *Model 2* $\bar{S}_{fga}$ is the female average sickness absence, in work group g at workplace a excluding individual i, $\bar{S}_{mga}$ is the male average sickness absence, in work group g at workplace a excluding individual i, and d_f is a dummy variable taking the value 1 if individual i is a woman.

In line with the insights from social psychology about the dynamics of social interactions we extend our model to allow the peer effect to differ with respect to the time the individual has been employed in a specific work group. The model (*Model 3*) takes the following form:

$$(3)\quad s_{iga} = \beta \bar{S}_g + \sum_t \delta_t d_t \bar{S}_{-i,ga} + \mathbf{X_{iga}}\phi + \mathbf{Y_a}\gamma + \mathbf{D_a}\varphi + \varepsilon_{iga},$$

where d_t is a dummy variable indicating if the individual started in the work group in year t, $t = 2003,...,2006$.

3.2 Empirical challenges

The difficulties with empirically estimating social interactions have been given much attention in the literature and many attempts have been made to overcome the econometric challenges. In the influential work by Manski (1993, 1995), the problem of identification is discussed. Manski identifies three types off effects that may cause the individual and the group behavior to correlate; endogenous effects, exogenous effects and correlated effects. The endogenous effect refers to idea that the propensity of an agent to behave in some way varies with the behavior of the group. Exogenous effects imply that

the propensity of an agent to behave in some way varies with characteristics of the group members. Correlated effects refer to the idea that agents in the same group tend to behave similarly because they have similar individual characteristics or face similar institutional environments. The difficulty of separating these three effects is known as the *reflection problem*. In addition to the problem of identification that is general to all peer effect studies, there are also certain methodological problems specific to studies on peer effects regarding sickness absence. In the following we address both general and specific empirical challenges associated with our study.

Correlated effects

When discussing correlated effects in the peer effects literature, two concepts relevant to our study are often mentioned: the problem of unobservable institutional characteristics and the problem of sorting. In our setting, unobservable institutional characteristics could include factors such as working conditions and quality of management. Consider for instance the case of poor working conditions. Poor working conditions are likely to have a negative impact on the general health status of the workers and are, consequently, likely to affect the sickness absence of both the individual and his/her peers. In our study sorting could also be problematic if individuals with similar characteristics, important to the sick leave decision, self-select into specific work places or work groups. In previous studies, the problem of correlated effects has been dealt with in primarily two ways. Ichino and Maggi (2000) and Gaviria and Raphael (2001) use a large number of control variables while Lundborg (2006), Soetevent and Kooreman (2007) and Clark and Lohéac (2007) employ fixed effects. Following the latter, work place fixed effects are employed to control for heterogeneity across work places. Moreover, we believe that workers may indeed self-select into work places. However, given the nature of the municipality's hiring process and how the workers are organized the possibility for workers to self-select into work groups is much more limited. Thus, in addition to controlling for heterogeneity across work places, including work place fixed effects also deals with the problem of sorting.

Correlated effects specific to research regarding sickness absence includes the existence

of contagious diseases and the possibility of an increased work load (as a consequence of an individual being absent) leading to more absence among remaining co-workers. Contagious diseases and increased work load due to absence, affecting all individuals in a work group simultaneously, may also cause a spurious correlation between the group and the individual. In order to address the concern of overestimation due to existence of contagious diseases and problems concerning increased work load within work groups, we use the results from *Model 2* and *Model 3*. First of all, separating the peer effect across gender as in *Model 2* is a mean of testing the possibility of the peer effect only reflecting correlation due to increased work load. Assuming that the increased work load is evenly distributed among colleagues, correlation due to increased work load could be expected to be equal across gender and age, respectively. Secondly, the data allows us to identify when an individual started working for the municipality (*Model 3*). This gives us a mean to determine whether peer behavior affects all individuals equally, irrespective of when they started working. If the peer effect only were to reflect correlation due to contagious diseases, the effect could be expected to be fairly equal across groups (or possibly, because of the time it takes to adapt to new bacteria, larger the later an individual started his/her work).

Contextual effects

As in many other peer effect studies we believe the problem of contextual effects to be negligible (Powell et al., 2005; Lundborg, 2006). More specifically, we do not find it likely that the individual sickness absence is affected directly by background characteristics of the peers. Rather, we believe this impact to be mediated via the sickness absence of the peers, thus, giving rise to endogenous and not contextual effects.

Endogeneity

Social interactions are bi-directional by nature, thus peer behavior is endogenous. Estimating the peer effects model without taking this into consideration may lead to biased estimates. In the peer effects literature several methods to come to term with the endogeneity problem have been applied: the use of instrumental variables, model specifications with non-linearities in the relationship between the behavior of the group

and the behavior of the individual, and the use of a lagged measure of peer behavior. Having access to data over several years, we follow Hanushek et al. (2003) and Clark and Lohéac (2007) and use lagged peer behavior when estimating *Model 1-3*.[4] Identification relies on the assumption that present individual behavior does not affect past group behavior.

Miss-specified reference groups

Another important issue when estimating peer effects is to identify the reference group relevant to the individual. Due to lack of detailed data, researchers are unlikely to know who actually interacts with whom and they are often forced to specify reference groups at very broad levels. For instance, reference groups have been formed to include *all* residents in a neighborhood, *all* students in the same school or grade or *all* workers at a work place. One of the strengths with our data is the highly detailed information concerning work place organization. For each individual worker, we are able to identify his/her colleagues on different work group levels. Consequently, our data allows us to study the effect of social interactions in reference groups close to the individual. There is, however, one potential problem when reference groups become *too* small. In contrast to reference groups that are too wide, we may instead get reference groups that are too narrow, hence excluding individuals that are indeed influential to the individual. This kind of measurement error may lead too attenuation bias in the estimates. In order to check the robustness of our results estimations are performed on two different sets of work groups. The sets of work groups are based on different levels in the organizational structure.

[4] We have also performed IV estimations using peer background characteristics as instruments. In resemblance with other peer effect studies the IV estimates are substantially larger than the OLS estimates (Ichino and Maggi, 2000; Lundborg, 2006; Trogdon et al., 2008). There is however no qualitative difference between the IV and the OLS estimates. The reliability of the IV estimations relies heavily on the quality of the instruments. In our study the correlation between the instruments and the peer behavior is low, hence, we have chosen not to present the IV estimates in the paper. They can, however, be provided on request.

4 Data

The data used in this study is based on the employment records for the 50 largest work places run by the municipality of Örebro. The information has been provided by the department of human resources at Örebro municipality. The employment records hold information about all individuals working for the municipality, their individual characteristics, employment, and different kinds of work absence.[5] Contrary to national register data, the employment records hold information on all spells of sickness absence, not just those that exceed 14 days. Our data set contains yearly data for the period 2003 to 2006. The data is restricted only to include employees receiving a monthly salary and having worked more than 90 days during 2006. Furthermore, individuals in labor market programs are excluded from the data set.

The full data set for 2006 consists of 5 175 employees. The employees are organized into five different sectors: City Administration (CA), Child Care and Education (CCE), Culture and Tourism (CT), Central Planning (CP) and Health Care and Nursing (HCN). There are a number of different work places in each sector. Examples of work places are preschools, schools, libraries and nursing homes. The average work place in our sample consists of 103 workers. Each work place is sub divided into several work groups.[6] A work group is defined as a group of workers that have frequent contact and a common task to perform. An example of a work group is a team of teachers that are responsible for certain classes at a particular school. However, work groups can sometimes be defined on several levels. A team of teachers may for instance be divided into sub groups depending on what subject(s) they teach. The number of work groups used in the analysis thus depends on what level the work groups are defined. Our analysis is primarily based on a decomposition of workers into 388 work groups with an average of 13 workers. However, we also use a more narrow decomposition that yields 690 work groups with an

5 The data includes age, gender, residential area, wage, employment type, rate of employment, sickness benefits, parental leave, temporary parental leave, educational leave and leave of absence.

6 The employment records enabled identification of approximately 350 work groups. For most work places within the sector Child Care and Education work group information was missing and had to be collected manually.

average of 8 workers.

The dependent variable

The dependent variable is work absence due to illness. Due to the fact that the individuals' potential work days vary substantially across individuals and work groups, the number of days on sick leave as the dependent variable is potentially rather problematic.[7] In order to overcome this problem, our measure of work absence is defined as the fraction of days on sick leave, i.e., the number of days on sick leave as compared to the number of potential work days, where the potential work days for an individual is computed as: PW_i = (days of employment * rate of employment) – (days of parental leave + days of educational leave + days of leave of absence). This measure enables comparison between individuals with, possibly, different lengths of employment.

Peer measure

Due to the informative data structure in terms of organization of individuals, we are able to construct a measure reflecting peer behavior on a very detailed level. Our measure of peer behavior is the share of absence due to illness in the work group, excluding individual i. The measure is computed as

$$\bar{S}_{-i,g} = \sum_{j=1, j\neq i}^{N_g} S_{jg} \Big/ \sum_{j=1, j\neq i}^{N_g} PW_{jg}$$

where S_{jg} is number of days on sick leave for individual j in group g, PW_{jg} is the number of potential work days for individual j in group g and N_g is the number of workers in work group g. In *Model 2* peer behavior is separated across gender.

Control variables

In addition to the variables reflecting sickness absence, the data set contains several other

7 Potential work days are defined as the total number of working days during a time period, excluding parental leave educational leave and leave of absence.

individual and work place specific variables that could potentially influence the individual's sick leave decision. Our control variables include individual characteristics and work place characteristics. The individual variables are age, gender, monthly salary, type of employment, rate of employment, profession, residential area and sector.

Descriptive statistics

Descriptive statistics for the whole data set, in total and by gender are shown in Table 1.[8]

Table 1: Descriptive statistics

	Mean (St dev)		
Variables	Total	Men	Women
Dependent variables[a]			
Share of sickness absence	0.076	0.035	0.081
	(0.185)	(0.112)	(0.202)
Days of sickness absence	22.42	11.02	26.50
	(56.16)	(36.03)	(61.26)
On sick leave (1=on sick leave during 2006)	0.64	0.47	0.70
Potential working days (PW)	304.62	324.87	297.40
	(76.78)	(81.44)	(77.23)
Control variables			
Age	47.25	48.97	46.99
	(11.07)	(11.31)	(10.98)
Monthly salary	20 964	22 915	20 267
	(4 476)	(5 070)	(4 022)
Gender (1=woman)	0.74	0	1
Term of employment (1=permanent)	0.87	0.86	0.88
Employment rate	0.93	0.98	0.92
	(0.13)	(0.09)	(0.13)
New worker (1=started working during 2006)	0.05	0.05	0.05
Mover (1=changed working place during 2006)	0.03	0.03	0.03
Residential area			
Concrete suburb (1=Concrete suburb)	0.08	0.07	0.08
Block of flats (1= Block of flats)	0.31	0.32	0.31
Residential area (1= Residential area)	0.33	0.34	0.32
Country side (1= Country side)	0.28	0.28	0.29
Sector			
City Administration (1= City Administration)	0.02	0.03	0.01
Child Care and Eduacation (1= Child Care and Eduacation)	0.37	0.51	0.32
Culture and Tourism (1= Culture and Tourism)	0.03	0.04	0.03

8 The work force characteristics in Swedish municipalities differ from those in the private sector and in other parts of the public sector. The differences are particularly large regarding the share of female workers, the average wage level and the average level of education. According to Statistics Sweden the fraction of women in the Swedish labor force in 2006 was 0.47. The average monthly salary amounted to 25 000 SEK in the same year, and the share of the workers with post-secondary education was 0.36. The work force characteristics in Örebro municipality are, however, similar to those in other Swedish municipalities.

Central Planning (1=Central Planning)	0.10	0.26	0.04
Health Care and Nursing (1= Health Care and Nursing)	0.48	0.16	0.60
Number of observations	5 175	1 361	3 815

a. Note that "Share of sickness absence" is the only dependent variable used in the regressions. "Days of sickness absence", "Sickness absence", and "Potential work days" are only auxiliary variables.

The average share of sickness absence in the full sample is 0.076, which corresponds to 22 days on sick leave per year. Rather striking is the large difference between male and female workers. The female average share of sick leave is more than twice as large as the male average share of sick leave. This is mainly due to a larger share of female workers being on long term sick leave. Moreover, a larger fraction of the women has been on sick leave during the given time period. In addition to the gender differences in sickness absence, data reveals that male workers have higher average wages and higher average rate of employment.

5 Results

5.1 Peer effects

The results from the OLS estimations of *Model 1-3* are reported in *Table 2*. All regressions use lagged peer behavior. [9]

In column one and two estimations of *Model 1* are presented. The only difference between *Model 1a* and *Model 1b* is the sizes of the peer groups, where Model 1b uses the somewhat larger groups. The estimated peer effects are positive, with a magnitude of 0.13 and 0.21, respectively. The interpretation of the most restrictive estimate is that an individual's sickness absence is expected to increase by 0.13 days if the average sickness absence of his or her peers increases by one day.

The result from *Model 2*, where peer behavior is separated across gender, is presented in column three. Our results indicate that the peer effect is different across gender. Peer behavior seems to be important to women but not to men. However, women are only

[9] In all regressions the lag length is t-1. Using different lag lengths (t-2 and t-3) yield qualitatively similar results.

affected by the behavior of their female peers and not by the behavior of male co-workers. The estimated effect of female peers on female workers is 0.16.

The result from *Model 3* reveals that the peer effect varies across individuals with different lengths of employment. As can be seen in column four the estimated peer effect for individuals having started work before 2003 is 0.25. The peer effect for individuals having started work in 2003 or 2004 is not statistically different. However, for those individuals having started work during 2005 or 2006, the peer effect is significantly smaller than for those having started work before 2003. Our interpretation of the estimates is that the behavior of the individual gradually adapts to the behavior of the group. As indicated by our results this adaptation seems to take about two to three years.

Table 2: The effect of peer behavior on individual sickness absence

Variables	OLS			
	Model 1a	Model 1b	Model 2	Model 3
Peer behavior	0.13***	0.21***		0.25***
	(0.04)	(0.05)		(0.04)
Women's peer behavior on women			0.16**	
			(0.07)	
Women's peer behavior on men			-0.02	
			(0.06)	
Men's peer behavior on women			-0.08	
			(0.08)	
Men's peer behavior on men			0.01	
			(0.04)	
Peer behavior * started working 2003				-0.09
				(0.13)
Peer behavior * started working 2004				-0.06
				(0.13)
Peer behavior * started working 2005				-0.27***
				(0.06)
Peer behavior * started working 2006				-0.26***
				(0.26)
Age	8.92e-04***	8.39e-04***	6.39e-04***	7.82e-04***
	(2.68e-04)	(2.71e-04)	(3.17e-04)	(2.76e-04)
Monthly salary	-2.78e-06***	-2.76e-06***	-1.71e-06*	-3.15e-06***
	(8.85e-07)	(8.60e-07)	(9.83e-07)	(9.53e-07)
Gender	0.03***	0.03***	0.01*	0.03***
	(4.54e-03)	(4.54e-03)	(7.05e-03)	(5.00e-03)
Terms of employment	0.04***	0.05***	0.04***	0.04***
	(6.40e-03)	(6.70e-03)	(7.85e-03)	(6.59e-03)
Employment rate	-0.12***	-0.13***	-0.13***	-0.13***
	(0.03)	(0.03)	(0.03)	(0.03)
New worker	-0.02***	-0.02***	-0.02**	-5.50e-03**
	(6.55e-03)	(6.55e-03)	(7.06e-03)	(7.10e-03)

Mover	7.86e-03	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Residential areas	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes
Occupational dummies	Yes	Yes	Yes	Yes
Work place fixed effects	Yes	Yes	Yes	Yes
No of work groups	690	388	212	388
No of observations	5 175	5 175	3 571	5 175

5.2 Sensitivity analysis

Outliers, the large number of very small work groups and the large fraction of employees that either started working in, or changed to a new work group within the municipality during 2006 are factors that may potentially affect the results. In *Table 3 Model 1b* is re-estimated taking each of these factors into consideration.[10] The estimated peer effect is positive in all regressions with coefficients that range from 0.16 to 0.21.

Table 3: Sensitivity analysis

	Outliers[a]	**Small work groups**[b]	**Newcomers**[c]
Peer behavior	0.21***	0.16**	0.19***
	(0.05)	(0.05)	(0.05)
Number of observations	4 415	4 602	4558
Number of work groups	337	344	386

Note: Clustered and robust standard errors are shown in parentheses. (***) and (**) indicate statistical significance at the 1% and 5% levels, respectively.
a. Work groups with at least one individual having a share of sickness absence above 0.95 are removed from the sample
b. Work groups with fewer than five workers are dropped from the sample.
c. Individuals that either started working or changed to a new work group during 2006 are dropped from the sample.

[10] Re-estimating Model 1a yields qualitatively similar results.

6 Conclusions

This paper contributes to the strand of empirical literature on how peer behavior influences individual sickness absence. Detailed employment records allow us to identify work groups as well as work places. By introducing fixed effects on the work place level, when estimating work group peer effects, we can control for institutional factors on the work place level. Work place fixed effects also provides a mean to deal with the problem of sorting of employees across work places. Furthermore, we have access to data on sickness absence for several years. This allows us to, at least partially, address the problem of endogeneity by using lagged peer behavior.

The results in our study indicate that the peer effect regarding sickness absence is positive. In effect, an increase in the average sickness absence among peers is expected to increase the individual sickness absence. The estimated peer effects range between 0.13 and 0.21. When the peer effect is differentiated across gender, we find that peer behavior is important to women but not to men. However, women are only affected by the behavior of their female peers and not by the behavior of male co-workers. Furthermore, our results indicate that it, on average, takes two to three years for new employees to adapt to the absence pattern of the peers. The asymmetric pattern of the peer effect with respect to gender and with respect to length of employment leads us to believe that our estimates do not only reflect correlation due to contagious diseases and increased work load. Rather, this pattern strengthens our belief that the estimated peer effects reflect the importance of social interplay between individuals.

In conclusion, our results indicate that the behavior of the peers is important to the individual sickness absence, hence, we cannot rule out the importance of social norms. As a consequence, policy interventions intended to reduce sickness absence could be amplified due to the effects of interaction among co-workers in work groups.

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Appendix

The Swedish sickness insurance system

The Swedish sickness insurance system is mandatory and covers all employed and self-employed workers in Sweden. The insurance system provides economic compensation in the event of work incapacity exceeding 25% of full time. In Sweden a worker can be on sick leave 25%, 50%, 75% or 100% of full time. The responsibility of providing economic compensation is shared between the employer and the Swedish government. The first part of the sickness spell, from day two to day fourteen, is paid for by the employer. (No compensation is paid the first day of the sickness spell. This is the so called waiting period.) The government is responsible for any additional time of sickness absence. The money paid by the Swedish government is mediated via the Swedish Social Insurance Agency. Up to a certain limit, the sickness benefit corresponds to 80% of the individual monthly salary. Above the cap, the compensation is fixed to 80% of the amount of the limit. In December 2006 the cap was 33 100 SEK (approximately 4000 USD).

In addition to benefits paid by the Swedish insurance system, some employees receive supplementary compensation from their employers.